

# Alber Universal Xplorer Industrial Monitor (UXIMe) Battery Monitor

## Product Description Guide



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# 1. Glossary of Terms

The following is a list of terms commonly used with respect to batteries and battery monitoring.

| Term                              | Definition   |
|-----------------------------------|--|
| <b>Battery</b>                    | Two or more cells connected together electrically in series or parallel.   |
| <b>Cell</b>                       | The basic electrochemical unit, characterized by an anode and a cathode, used to receive, store and deliver electrical energy.   |
| <b>Current transducer</b>         | The component that measures current.   |
| <b>DC resistance measurement</b>  | A test method that places a load across a group of cells and measures the instantaneous voltage response to calculate the battery's state of health.                             |
| <b>Discharge rate</b>             | The rate, in Amperes or Watts, at which current or power is delivered by a battery.  |
| <b>Float current</b>              | The current drawn by a cell that is being float charged.   |
| <b>Intercell connector</b>        | An electrical conductor used to connect adjacent cells on the same rack.   |
| <b>Intertier connector</b>        | An electrical conductor used to connect two cells on different steps of the same rack.   |
| <b>Internal ohmic measurement</b> | A measurement of the electronic and ionic conduction path within a cell or unit using techniques commonly known as impedance, conductance or resistance tests.                   |
| <b>Jar</b>                        | The container that holds a cell or a group of cells. A battery container can be a single cell or multicell unit, also called a <i>monobloc</i> .                                 |
| <b>Monobloc or multicell unit</b> | A multicell container in which cells are installed.<br>(Multicell Unit <i>US</i> , Monobloc <i>outside the US</i> )  |
| <b>Ohmic value</b>                | The unit of measure that indicates resistance of a conductor (intercell or intertier) or a cell / monobloc.  |
| <b>Ripple current</b>             | A type of electrical noise characterized by a uniform waveform riding in the DC circuit, normally expressed as peak, peak to peak, or RMS (Root Mean Square) voltage or current. |
| <b>String</b>                     | A number of cells connected together in series to form a battery.  |

**Table 1 - Glossary of Terms**

## 2. Product Overview

### 2.1 Product Description

The Universal Xplorer Industrial Monitor (UXIMe) is a stationary battery monitor designed for use in Industrial or Utility applications. Standard configurations specifically designed for Utility Substations for 120V and 48V applications, make it ideal for NERC compliancy. Each monitor is considered a stand-alone system, in that no external computer is required for normal operation. Standard provisions are included to allow integration into customer owned Building Management or Enterprise Systems.

Complete and comprehensive remote monitoring capabilities include features you expect.

- Remote access via Ethernet or RS-485 using industry standard protocols such as Modbus or SNMP for simple BMS integration.
- Embedded Web servers permit Web browsing from any PC on the network for quick real-time battery viewing to inspect data in easy to interpret graphical views for all cell and string level parameters, active monitor status and state of active or latched alarms.
- Embedded email clients for alarm notifications and data delivery of battery parameters (XML format) with priority handling of message sent to responsible service technicians.
- Local USB connectivity to view and analyze battery systems using laptop computers.

With the UXIMe, all your battery parameters are measured and constantly monitored against user defined thresholds. What sets Vertiv monitors apart from others is the ability to provide early warning of potential battery problems by performing a proactive, patented resistance test, a proven technology to reliably predict battery performance. To complement the proactive resistance test, the following parameters are monitored to ensure optimal battery performance and life:

- Cell Level Measurements
  - Individual Cell Resistance
  - Individual Cell Voltage
  - Individual Intercell Resistance
  - Electrolyte Level (Optional)
- System Level Measurements
  - Overall Volts
  - String current (Discharge/Float)
  - Ripple Current
  - Ambient Temperatures
  - Charger Cable Resistance
  - Ground Fault Currents

For details on parts inventory, installing and maintaining the UXIMe, refer to the UXIMe Installation Guide.

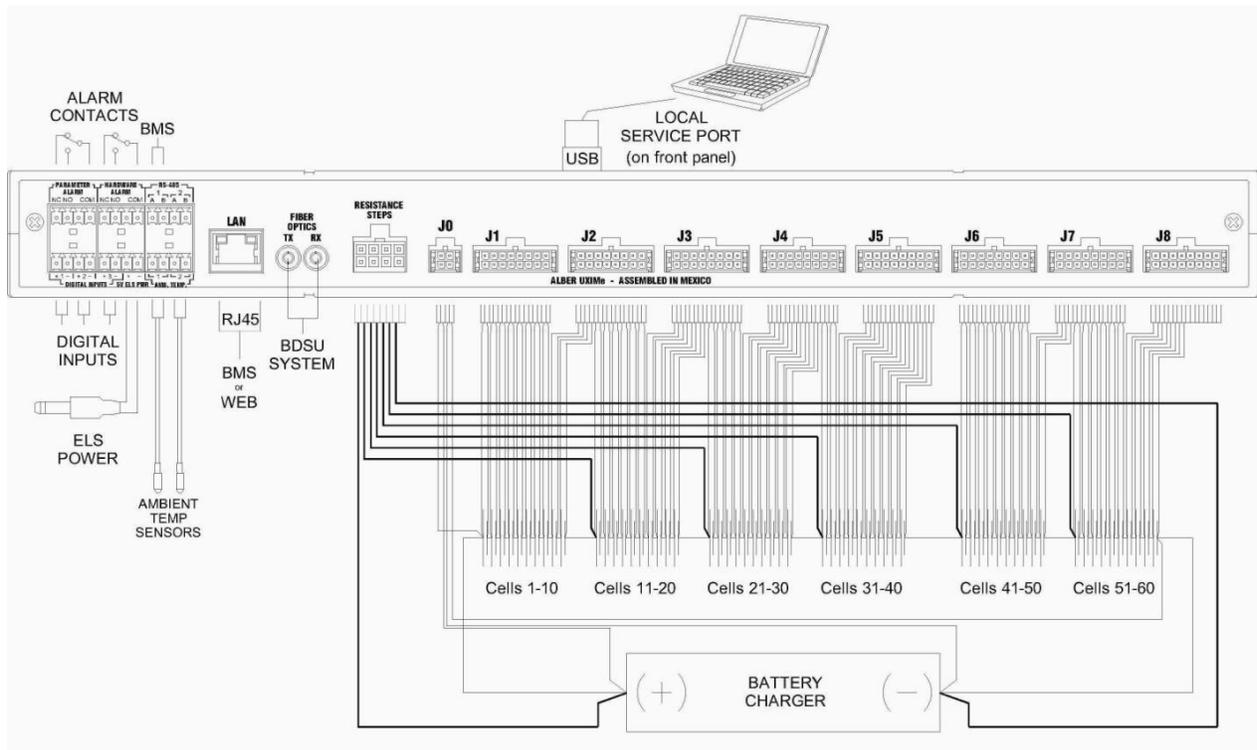
## 2.2 Supported System Configurations

Refer to the following table to identify supported systems. As the table shows, the monitor has the ability to monitor up to 62 cells and can be used in eight different common configurations. If the desired configuration is not in the table, contact Vertiv for further information.

| Technology             | Nominal Volts | Battery/String Configuration<br>(Number of strings) x (Number of data points) x (Nominal voltage of data point) |
|------------------------|---------------|---|
| 2V cells, VLA/VRLA     | 48V           | 1X24X2V   |
|                        | 116V          | 1X58X2V   |
|                        | 118V          | 1X59X2V   |
|                        | 120V          | 1X60X2V   |
|                        | 122V          | 1X61X2V   |
|                        | 124V          | 1X62X2V   |
| 12V modules, VRLA      | 120V          | 1X10X12V  |
| 6V module, VLA or VRLA | 120V          | 1X20X6V   |

**Table 2 - Supported System Configurations**

The figure below shows a typical system connection for a single string of 60 cells.



**Figure 1 - System Connections (1X60X2V Configuration)**

## 3. Features

- All system configurations are field configurable
- Continual real time scanning of the following parameters:
  - Individual cell voltage
  - String discharge current
  - String float current
  - String ripple current
  - Overall voltage
  - Ambient temperatures
- Automatic/ scheduled testing of internal resistance, intercell and intertier connection measurements
- Stores discharge events to allow playback of recorded data including cell voltages, currents and temperatures
- Stores historical data for all monitor data and alarm data for trending purposes
- Fiber optic connectivity for BDSU system network integration
- Form C contact for battery parameter or hardware alarm
- Embedded Web server for viewing battery data via Web browsers
- Embedded email manager for delivery of alerts and battery data on a defined priority to service technicians.
- Isolated RS-485 interface for third party vendor integration
- Ethernet connectivity for connection to company network
- Compact 1U, 19" rack mount enclosure
- USB connectivity for PC to allow real time data viewing and configuration
- Local status indicators and alarm reset
- Maintenance override - global disable of all alarms
- Self calibrating
- Supports MODBUS (via RS-485 and Ethernet) SNMP and SMTP (via Ethernet) protocols
- Supports integration to ELS2 Electrolyte Level monitor

The system is compatible with the BDSU architecture. For a full description of features used with that system, refer to the BDSU Product Description Guide.

## 4. Measurement Capabilities

The UXIMe has the following measurement capabilities.

### Cell or Monobloc Level Measurements (Max)

- 62 voltages, 2 volt
- 62 internal resistances
- 61 intercell resistances

### String Level Measurements

- Overall voltage
- Discharge current
- Float current
- Ripple current
- $\pm$  Charge cable resistance
- Ground fault currents
- 4 intertier resistances

### System Level Measurements

- 2 ambient temperatures

## 5. Operating Modes

Although the monitoring system excels as a maintenance tool, the real advantage is knowing the current status of the batteries at a glance or being notified via email when there is an issue. By using status lights and extensive graphics when used with the Battery Explorer software, pertinent status and alarm events are easily accessible.

### 5.1 Normal Operating Mode

In normal operating mode, the system continuously scans all parameters within a one-second time frame. As readings are taken, they are compared to user-programmed alarm thresholds. Each parameter is constantly compared to the previously scanned value and, if the value exceeds an alarm threshold, the unit triggers an alarm event, causing the Form C alarm contact to activate. If Email Dispatcher is configured, a message will be sent to the first priority responder. Up to five levels of priorities and the number of repeat messages sent to each priority responder is configurable.

### 5.2 Discharge Mode

If a discharge is detected, the system goes into a data logging mode and stores discharge start and end times, lowest overall voltage reached, highest string current reached during the event, and all cell voltages during the discharge event. These discharge events can then be played back later for further analysis.

### 5.3 Acceptance/Performance Test

Real time data viewing allows the user to monitor the individual cell voltage, cell temperature, overall voltage and discharge currents during a discharge. Seeing real-time data during acceptance testing is critical in identifying faulty connections or cells.

### 5.4 Resistance Test

A battery resistance test may be performed at user-set intervals or on demand. The test utilizes a patented technology that can identify failing cells or monoblocs, allowing service to be performed on a proactive schedule. Additional measurements taken include intercell, intertier/inter-row, and charger cable resistance measurements for identifying bad connections due to improper torque or corrosion at the connections.

### 5.5 Ground Fault Detection

Vertiv's patent pending ground fault detection system measures ground currents periodically throughout the entire string. Fault currents are identified and displayed graphically to identify what cell or area of the battery has a fault to highlight potential leaking cells creating shorts to ground.

### 5.6 Alarm Mode

Every monitored parameter can have an assigned alarm threshold. When any parameter goes outside the normal range, the Alarm LED lights and the Parameter Alarm Form C contact energizes. The event can be programmed to stay latched until the alarm is reset.

In the UXIMe, the normally open (NO) contact of the Hardware Alarm relay becomes active after successful bootup of the system and stays in this state during normal operation. The relay changes state and makes the normally closed (NC) contact active during a firmware upgrade or for any of the following fault conditions.

1. Power fault
2. Application code fault accompanied by an unsuccessful recovery
3. MLM (load module) failed

The status of the MLM is also available via MODBUS over RS-485 and IP as an additional monitoring point to the Hardware Alarm dry contacts.

### **5.7 Email Dispatcher**

The Email Dispatcher is a configurable embedded email service that can be set up in a couple of different modes. One is the email notification of alarms handled by a priority manager. This priority manager can have up to five emails assigned in a priority with the ability to set the number and frequency of message attempts. The second mode is an automatic data delivery mode that will automatically send an email with the latest set of data available within the UXIMe. This data is delivered in an XML format.

## 6. Model Number Descriptions

The model number is in the format of PPPP-COB, where PPPP is 1013 and C, O, and B are described below.

| PPPP-       | C | O | B | Description    | Choices  |
|-------------|---|---|---|----------------|--|
| <b>1013</b> | C |   |   | Communications | 0 = RS-485 Only<br>1 = Network<br>2 = Fiber Optic<br>3 = Network and Fiber Optic |
| <b>1013</b> |   | O |   | Options        | 0 = None<br>1-9 = Reserved   |
| <b>1013</b> |   |   | B | Branding       | 0 = OEM<br>1-9 = Reserved  |

**Table 3 - Model Number Description**

## 6.1 Parts List

The following items are included with each order of a UXIMe.

| Name   | Part Number   | Description  | Requirements  |
|--|---|--|---|
| <b>UXIMe Battery Monitor Module</b>                | 1013-###<br>### - See table 3   | UXIMe Battery Monitor Module.  | One supplied per system   |
| <b>Sense lead harness (standard)</b>               | 1102-560-XX<br>XX=length<br>Available in 25', 50', 75' or 100'  | Harness for monitoring internal cell voltage/internal resistance, and intercell resistance   | Eight supplied per system.  |
| <b>Load lead harness (standard)</b>                | 1102-550-XX<br>XX=length<br>Available in 25', 50', 75' or 100'  | Harness for connecting power and load module for internal resistance testing   | One supplied per system   |
| <b>Single Ambient temperature sensor harness</b>   | 1102-553-XX<br>XX=length<br>Available in 8', 25', 35' 50', 75' or 100'<br>1102-554-XX<br>XX=length<br>Available in 8', 25', 35', 50', 75' or 100' | One Ambient temperature sensor used to monitor room or cabinet temperature.<br><br>Optionally, a double ambient temperature sensor can be ordered. Contact your Vertiv Sales representative for details. | One supplied per system.<br><br>Double Ambient Temperature Sensor harness is (optional) |
| <b>USB Cable</b>                                   | 2025-108  | 3 meter USB communication cable  | One supplied per system   |
| <b>Load Fuse Holder</b>                            | 1102-551  | Fuse holder for connecting the load fuse   | Seven supplied per system   |
| <b>Load fuse</b>                                   | 4301-015  | Fuse used in fused load lead   | Seven supplied per system   |
| <b>4 Position Connector</b>                        | 2140-047  | 4 position plug connector for connecting digital inputs, RS-485 communication and alarm contacts   | Five supplied per system  |
| <b>Charger cable resistance harness (standard)</b> | 1102-552-XX<br>XX=length<br>Available in 25', 50', 75' or 100'  | Harness for monitoring charger cable resistance measurements.  | One supplied per system   |
| <b>10K Resistor Sense Lead Assembly</b>            | 1102-555  | 10K Resistor sense leads assembly connectors   | 136 supplied per system   |
| <b>Single Tab Washer</b>                           | 2120-164  | 5/16 single tab washer   | 140 tab washers are supplied per system   |
| <b>Software CD</b>                                 | 2027-029  | UXIMe software installation CD   | 1 CD is supplied  |
| <b>Flush Mounting Kit</b>                          | KIT 1400-531  | Optional flush mounting kit  | The flush mounting kit is sold separately. Contact your Vertiv Sales representative.    |

**Table 4 - Standard Parts List**

## 7. Panel Controls and Indicators

This section describes the front and rear panels of the UXIMe. Additional descriptions may appear elsewhere in this guide or in related manuals.

### 7.1 Front Panel (All Models)

This section describes the components on the front panel of the UXIMe.

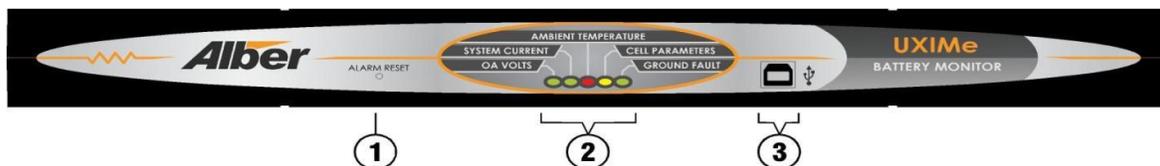


Figure 2 - UXIMe Front Panel

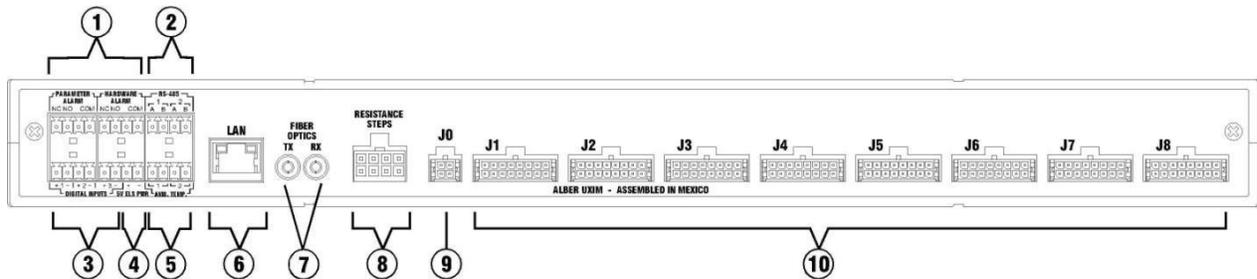
The UXIMe front panel has the following components. The numbers in the table refer to the callout numbers in the preceding figure.

| Number | Description            | Function  |
|--------|------------------------|---|
| 1      | Alarm Reset Button     | Reset button for resetting latched alarms.  |
| 2      | Front Panel Indicators | <p>Used for showing system alarm status and mode of operation.</p> <ul style="list-style-type: none"> <li>• OA VOLTS LED – stays off or blinks green when no alarms are present. The LED stays red and scans amber when the overall volts are out of range.</li> <li>• SYSTEM CURRENT LED – stays off or blinks green when no alarms are present. The LED stays red and scans amber when the system current is out of range.</li> <li>• AMBIENT TEMPERATURE LED – stays off or blinks green when no alarms are present. The LED stays red and scans amber when the ambient temperature is out of range.</li> <li>• CELL PARAMETERS LED – stays off or blinks green when no alarms are present. The LED stays red and scans amber when the cell parameters are out of range.</li> <li>• GROUND FAULT LED – stays off and scans green when no alarms are present. The LED stays red and scans amber when the system detects a ground fault has occurred.</li> <li>• All LEDs sequentially scans amber while system is in maintenance mode.</li> <li>• All LEDs flash amber while system is performing a battery discharge.</li> <li>• All LEDs flash green while system is running a resistance test.</li> <li>• All LEDs flash red and alternating green while system is performing a firmware upgrade.</li> <li>• All LEDs flash red when system has hardware fault.</li> </ul> |
| 3      | USB Connection         | Allows connectivity of computers for setup, configuration, and real time data viewing.  |

Table 5 - UXIMe Front Panel Component Descriptions

## 7.2 Rear Panel

This section describes the components on the rear panel of the UXIMe.



**Figure 3 - UXIMe Rear Panel**

The UXIMe rear panel has the following components. The numbers in the table refer to the callout numbers in the preceding figure.

| Number | Description                     | Function   |
|--------|---------------------------------|--|
| 1      | Alarm Contact                   | Form C alarm contact for remote parameter or hardware alarm notification.  |
| 2      | RS-485 Connection               | Two ports available; One for remote communications using the MODBUS protocol and the second is used for communicating to optional accessories. |
| 3      | Digital Inputs                  | Used for monitoring wet or dry contact inputs.   |
| 4      | ELS Power Connection            | ELS <sub>2</sub> +12VDC; 375mA power supply connection   |
| 5      | Ambient Temperature Inputs      | Ambient temperature probe connection.  |
| 6      | LAN Connection                  | Ethernet connection for network connectivity. This is optional and is only available on the 1013-1XX or 1013-3XX models.                       |
| 7      | Fiber Optic Connections         | Used for communication to the BDSU network. This is optional and only available on the 1013-2XX or 1013-3XX models.                            |
| 8      | Load Inputs                     | Load connections for performing internal resistance measurements.  |
| 9      | Charger Cable Resistance Inputs | Sense lead connection for monitoring charge cable resistance.  |
| 10     | Cell Voltage Inputs             | Sense lead connections for making voltage measurements.  |

**Table 6 - UXIMe Rear Panel Component Descriptions**

## 8. UXIMe Specifications

### 8.1 UXIMe System Specifications

#### Safety Approvals

- UL61010-1
- EN61010-1
- IEC61010-1

#### EMC Approvals

- EN61326-1
- FCC part 15 class A

#### Operating Environment

- Temperature Range: 0°C to 55°C (32°F to 131°F)
- Humidity Range: 0% to 80% RH (non-condensing) at 5°C to 31°C, 0% to 50% RH (non condensing) at 31°C to 40°C
- Indoor Use Only
- Measurement Category O (500V Transient Rating)
- Pollution Degree 2
- Altitude: 0 to 2000 meters above sea level

#### Alarms

- 2 - Form C relay contact, 2A at 30Vdc

#### Input Power

- DC Power, 45VDC to 150VDC, 19W max.

#### ELS2 Output Power

- **DC Power, 12VDC, 375mA.**

#### Communications

- RS485/1 - MODBUS
- RS-485/2 - Proprietary for optional accessories
- Ethernet -TCP/IP MODBUS, SNMP, and SMTP
- USB
- Fiber optic for BDSU integration

#### Packaging

- 1U chassis
- 17.0"W x 1.75"H x 12.00"D
- 4.0 lbs.
- Wall or 19" Rack Mount

## 8.2 Cell Measurements

This section describes cell measurement specifications.

| Parameter                         | Tolerance   |
|-----------------------------------|---|
| Cell Voltage                      | 0 to 12V , 0.1% $\pm$ 2mV                                   |
| Internal Cell Resistance          | 0 to 32,000 $\mu\Omega$ , 5% of reading $\pm$ 2 $\mu\Omega$ |
| Intercell Resistance              | 0 to 5000 $\mu\Omega$ , 5% of reading $\pm$ 5 $\mu\Omega$   |
| Intertier/charge cable Resistance | 0 to 5000 $\mu\Omega$ , 5% of reading $\pm$ 5 $\mu\Omega$   |

**Table 7 - Cell Measurement Specifications**

## 8.3 System Measurements

This section describes system measurement specifications.

| Parameter           | Tolerance                                       | Number Of Inputs |
|---------------------|---|------------------|
| String Voltage      | 17Vdc to 150 Vdc $\pm$ .5%                      | Measured         |
| String Current      | 0 to 2000ADC $\pm$ 1% of full scale             | Calculated       |
| Ripple Current      | 0 to 250 Amperes RMS,<br>$\pm$ 5% of full scale | Calculated       |
| Float Current       | 0 to 5000mADC,<br>$\pm$ 50mA                    | Calculated       |
| Ambient Temperature | 0°C to 80°C $\pm$ 0.1°C (32°F to 176°F)         | 1                |

**Table 8 - System Measurement Specifications**

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